OPERATION

AND

SERVICE MANUAL

MODEL 3350/3351/3352 RF DETECTOR PLUG-IN UNIT

TM

TELONIC INSTRUMENTS

A Division of Telonic Industries, Inc.

60 N. First Avenue

Beech Grove, Indiana 46107

telonic

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AND
SERVICE MANUAL
T.O.S. NO. 154C

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WARRANTY

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INSTRUMENTS; Division of Telonic Industries, Inc. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble, plus the MODEL AND SERIAL NUMBERS of the unit must be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not. Contact TELONIC INSTRUMENTS at Post Office Box 87, Beech Grove, Indiana 46107 or your local TELONIC representative.

Serial No._____

TABLE OF CONTENTS

SECTION I. GENERAL INFORMATION

SECTION II. OPERATING INSTRUCTIONS

SECTION III. PRINCIPLES OF OPERATION

SECTION IV. MAINTENANCE

SECTION V. PARTS LIST AND SCHEMATIC DIAGRAMS

SECTION I

GENERAL INFORMATION

1-1. SPECIFICATIONS.

1-2. Tables 1-1. thru 1-3. list the specifications for the 3350, 3351 and 3352 RF DETECTOR PLUG-IN UNITS.

TABLE 1-1.

3350 Specifications	
Frequency Range-	100 kHz to 3000 MHz
Output Amplitude Variation-	±0.5 dB to 2000 MHz
	±1 dB to 3000 MHz
RF Input Impedance-	50Ω nominal
VSWR-	1.1:1 to 1500 MHz
	1.2:1 to 3000 MHz
Response Time (Nominal)	
Slow-	2 milliseconds
Medium-	200 microseconds
Fast-	20 microseconds
Conversion Factor-	*Greater than 1.5 at 0.5VRMS
*Conversion Factor = $\frac{\text{E dc output}}{\text{E rms input}}$	

TABLE 1-2.

3351 Specifications	
Frequency Range-	100 kHz to 1000 MHz
Output Amplitude Variation-	±0.5 dB to 1000 MHz
RF Input Impedance-	75Ω nominal
VSWR-	1.2:1 to 1000 MHz
Response Time (Nominal)	
Slow-	2 milliseconds
Medium-	200 microseconds
Fast-	20 microseconds
Conversion Factor-	*Greater than 1.5 at 0.5VRMS
*Conversion Factor = $\frac{\text{E dc output}}{\text{E rms input}}$	

TABLE 1-3.

3352 Specifications	
Frequency Range-	100 kHz to 1000 MHz
Output Amplitude Variation-	±0.5 dB to 1000 MHz

TABLE 1-3. (Cont)

RF Input Impedance-	60Ω nominal
VSWR-	1.2:1 to 1000 MHz
Response Time (Nominal)	
Slow-	2 milliseconds
Medium-	200 microseconds
Fast-	20 microseconds
Conversion Factor-	*Greater than 1.5 at 0.5VRMS

$$*\text{Conversion Factor} = \frac{E \text{ dc output}}{E \text{ rms input}}$$

1-3. DESCRIPTION. (Refer to figure 1-1.)

1-4. The 3350, 3351 and 3352 RF DETECTOR PLUG-IN UNITS are solid state units designed for use with the Telonic 2003 SWEEP/SIGNAL GENERATOR CONTROL CHASSIS. These detectors provide a negative dc output voltage proportional to the peak-to-peak amplitude of the RF input voltage from the unit under test.

Figure 1-1. RF DETECTOR PLUG-IN UNIT.

SECTION II

OPERATING INSTRUCTIONS

2-1. GENERAL.

2-2. This section provides the complete functional control description and operating instructions for the 3350, 3351 and 3352 RF DETECTOR PLUG-IN UNITS.

2-3. CONTROL PANEL DESCRIPTION.

2-4. FRONT PANEL. (Refer to figure 2-1.) Table 2-1. provides a complete functional control description of all Front Panel Controls and Connectors.

TABLE 2-1.

Front Panel Control and Connector Functional Description	
TIME CONSTANT Switch-	Provides a means of selecting Fast, Medium or Slow response time
RF IN Connector-	Provides electrical connection for the RF input

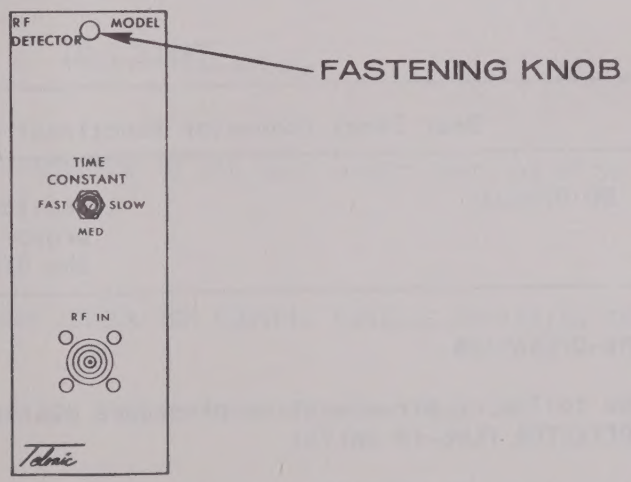


Figure 2-1. Front Panel Control and Connector.

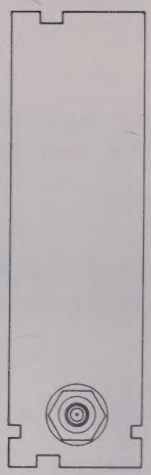


Figure 2-2. Rear Panel Connector

2-5. REAR PANEL. (Refer to figure 2-2.) Table 2-2. provides a complete functional description of the Rear Panel Connector.

TABLE 2-2.

Rear Panel Connector Functional Description	
DC Output-	Provides electrical connection for proportional negative DC output to the DISPLAY PROCESSING PLUG-IN UNIT

2-6. PRE-OPERATION.

2-7. The following pre-operation procedure must be performed before operating the RF DETECTOR PLUG-IN UNITS:

a. Insert the RF DETECTOR into the 2003 SWEEP/SIGNAL GENERATOR CONTROL CHASSIS (refer to figure 2-3.) and tighten the front panel knurled fastening knob.

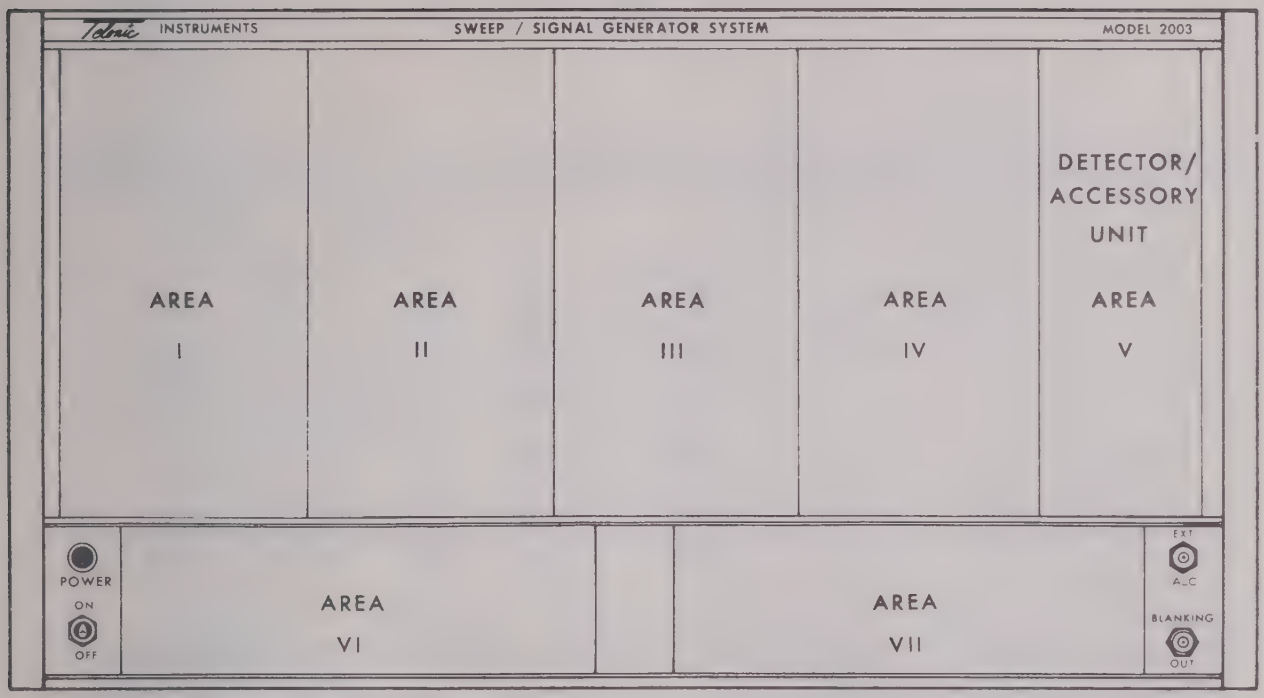


Figure 2-3. Plug-in Locations

b. Connect the 2003 and the RF DETECTOR to the unit under test, as shown in figure 2-4.

2-8. OPERATING PROCEDURE.

a. Refer to the 2003 SWEEP/SIGNAL GENERATOR CONTROL CHASSIS OPERATION AND SERVICE MANUAL for 2003 operation.

b. Set the TIME CONSTANT Switch for the desired response time.

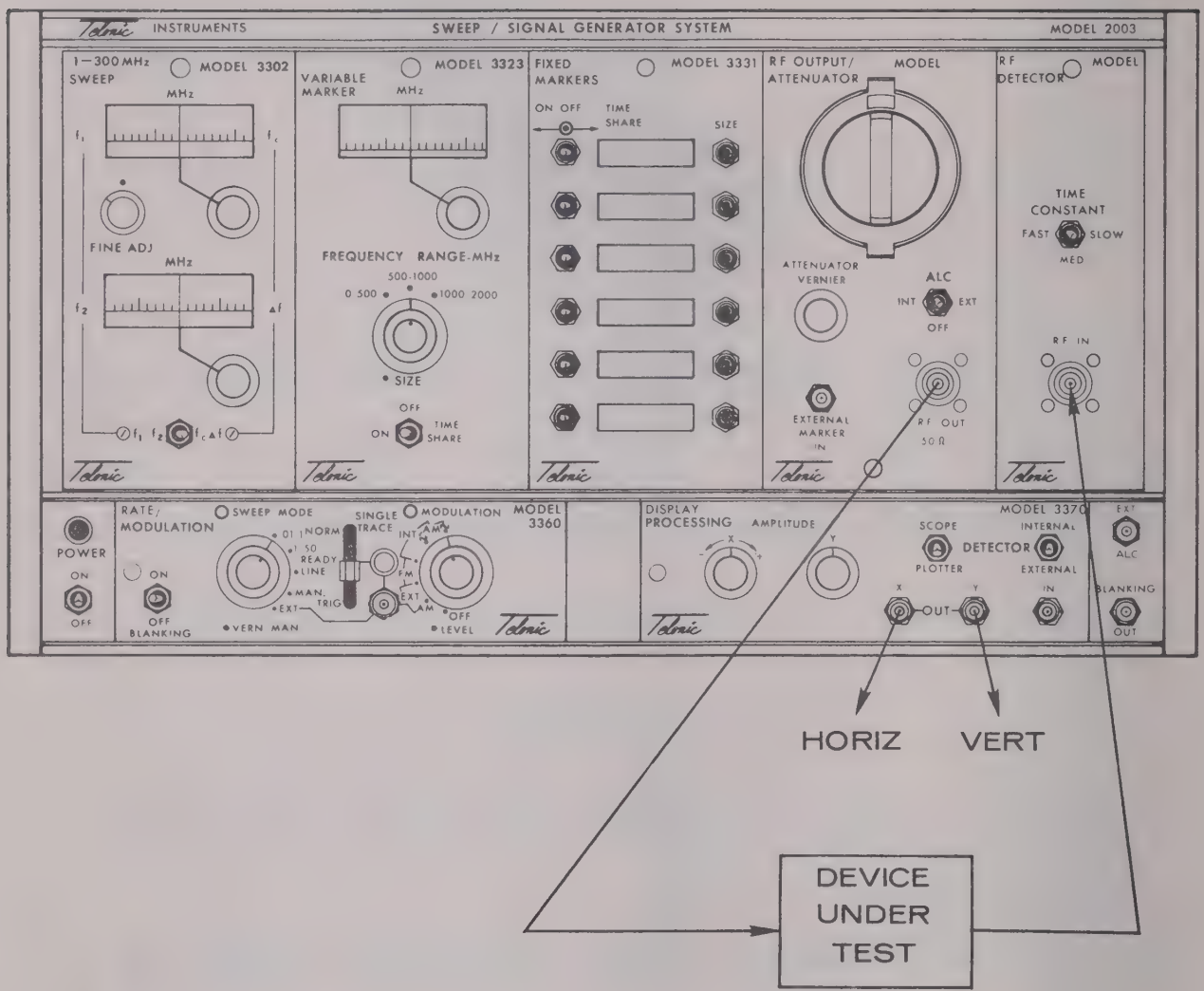


Figure 2-4. Typical Test Connections

SECTION III

PRINCIPLES OF OPERATION

3-1. GENERAL.

3-2. This section provides a brief description of the major circuits of the 3350, 3351 and 3352 RF DETECTOR PLUG-IN UNITS.

NOTE

Refer to appropriate schematic diagram, located in Section V, when reading principles of operation.

3-3. DETECTOR CIRCUIT.

3-4. The RF input is connected into the detector stage by Front Panel connector J1; impedance matching resistor R1 provides proper loading for the device under test.

3-5. Capacitor C1, diodes CR1 and CR2, and capacitor C2 form a half-wave voltage doubler circuit and resistors R2 and R3 provide high frequency compensation.

3-6. The pulsating negative DC output of the doubler circuit is filtered by inductor L1, capacitor C3 and resistor R6 and coupled out through connector J2. Resistor R4 prevents ringing of inductor L1 and resistor R5 provides a constant load for the output voltage.

3-7. INTERCONNECTION CIRCUIT.

3-8. The negative DC output voltage is coupled out of the detector through connector P1 to the Rear Panel output connector P2. Capacitors C1 and C2 are connected to the line by means of switch S1 to provide the three different response speeds. Both capacitors are in parallel with the line for Slow response, capacitor C2 only is connected for Medium response, and both capacitors are disconnected for Fast response.

SECTION IV

MAINTENANCE

4-1. GENERAL.

4-2. This section provides the necessary information to perform complete Flatness, VSWR and Efficiency tests of the 3350/3351/3352 RF DETECTOR PLUG-IN UNITS.

4-3. REQUIRED TEST EQUIPMENT.

4-4. The following test equipment will be required to perform maintenance on the 3350/3351/3352 RF DETECTOR PLUG-IN UNITS:

a. Sweep/Signal Generator Control Chassis	Telonic Model 2003 or equivalent
b. Sweep Oscillator Plug-in Unit	Telonic Model 3305 or equivalent
c. RF Output Plug-in Unit	Telonic Model 3343 (50Ω unit) Telonic Model 3345 (75Ω unit) Telonic Model 3347 (60Ω unit)
d. Rate/Modulation Plug-in Unit	Telonic Model 3360 or equivalent
e. Display Processing Plug-in Unit	Telonic Model 3370 or equivalent
f. Rhotector	Telonic Model TRB-4 or equivalent
g. Tunable Filter	Telonic Model TTF-72-5-3EE or equivalent
h. Oscilloscope	Analab Model 1100 or equivalent
i. Power Meter	Hewlett-Packard Model HP-431B or equivalent
j. Thermistor Mount	Hewlett-Packard Model HP-478A or equivalent

4-5. PERFORMANCE CHECK.

4-6. This check may be used as a routine maintenance procedure or as an incoming inspection to verify the performance of the RF DETECTOR PLUG-IN UNITS.

4-7. INITIAL SET-UP.

a. Connect the equipment as shown in figure 4-1.

b. Set the 2003 Controls as follows:

(1) POWER Switch (2003)	ON
(2) BLANKING (3360)	ON
(3) SWEEP MODE (3360)	LINE
(4) MODULATION (3360)	OFF
(5) SINGLE TRACE (3360)	NORM
(6) Mode Switch (3305)	$f_c/\Delta f$
(7) f_1-f_c Control (3305)	1500 MHz
(8) f_2-Δf Control (3305)	0 MHz
(9) SCOPE/PLOTTER Switch (3370)	SCOPE
(10) DETECTOR Switch (3370)	INTERNAL
(11) ALC Switch (3343/3345/3347)	INT.

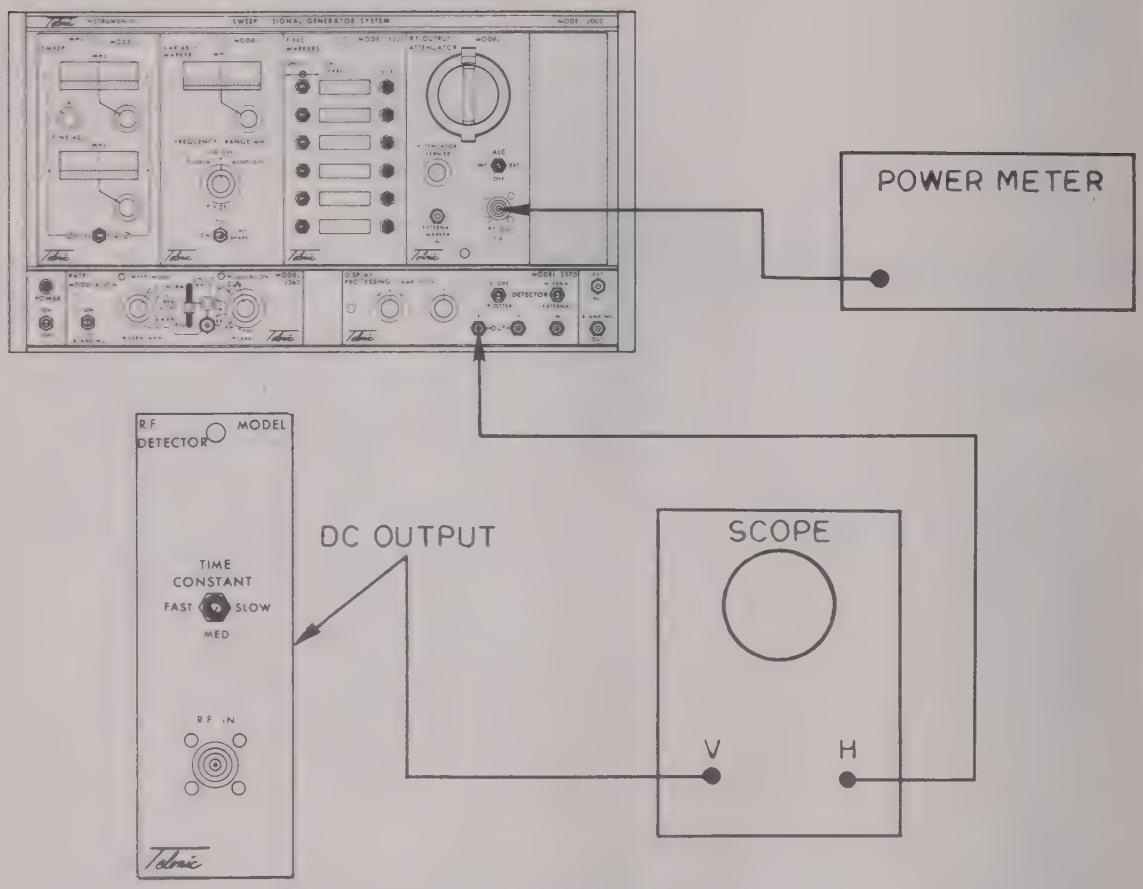


Figure 4-1. Typical Flatness Check Test Connections

4-8. FLATNESS CHECK.

4-9. The following steps give a complete procedure for checking output amplitude variation. (Flatness.)

a. Adjust the ATTENUATOR VERNIER Control for an indication of 0.5 mW on the Power Meter.

b. Disconnect the lead from the RF Output/Attenuator.

c. Connect a jumper cable from the RF OUT connector of the RF Output/Attenuator to the RF Detector's RF IN connector.

d. Adjust the oscilloscope for 10 cm of vertical deflection.

e. Reconnect the power meter and adjust the f_1-f_c control for 250 MHz.

f. Adjust the ATTENUATOR VERNIER control for an indication of 0.5 mW on the power meter.

g. Remove the lead from the RF Output/Attenuator and connect a jumper from the Attenuator to the RF DETECTOR; the vertical deflection of the scope should be 10 cm ±1/2 cm.

h. Repeat steps e. thru g. for frequencies of 500, 750 and 1500 MHz.

i. For frequencies between 2000 and 3000 MHz the allowable variation goes up to ±1 cm. (3350 and 3352 only.)

4-10. VSWR MEASUREMENT.

4-11. The following steps provide a means of measuring the VSWR of the RF DETECTORS.

a. Connect the equipment as shown in figure 4-2. and adjust the f_1-f_c control to 500 MHz.

b. Set the scope controls for 10 cm vertical deflection.

c. Remove the mismatch from the Rhotector's Z_2 connector and connect the RF DETECTOR in its place; a perfect impedance match will now provide no vertical deflection on the scope and the maximum allowable display is 10 cm.

d. Repeat steps a. thru c. for frequencies of 50, 100 and 200 MHz.

e. Excessive VSWR can be reduced by moving the detector assembly diode and resistor combinations and the finger stock around the 1% resistor.

NOTE

If changes are made to obtain the proper VSWR, repeat the flatness check.

4-12. DETECTOR EFFICIENCY.

4-13. The following procedure may be used to determine efficiency of the 3350/3351/3352 RF DETECTOR PLUG-IN UNITS.

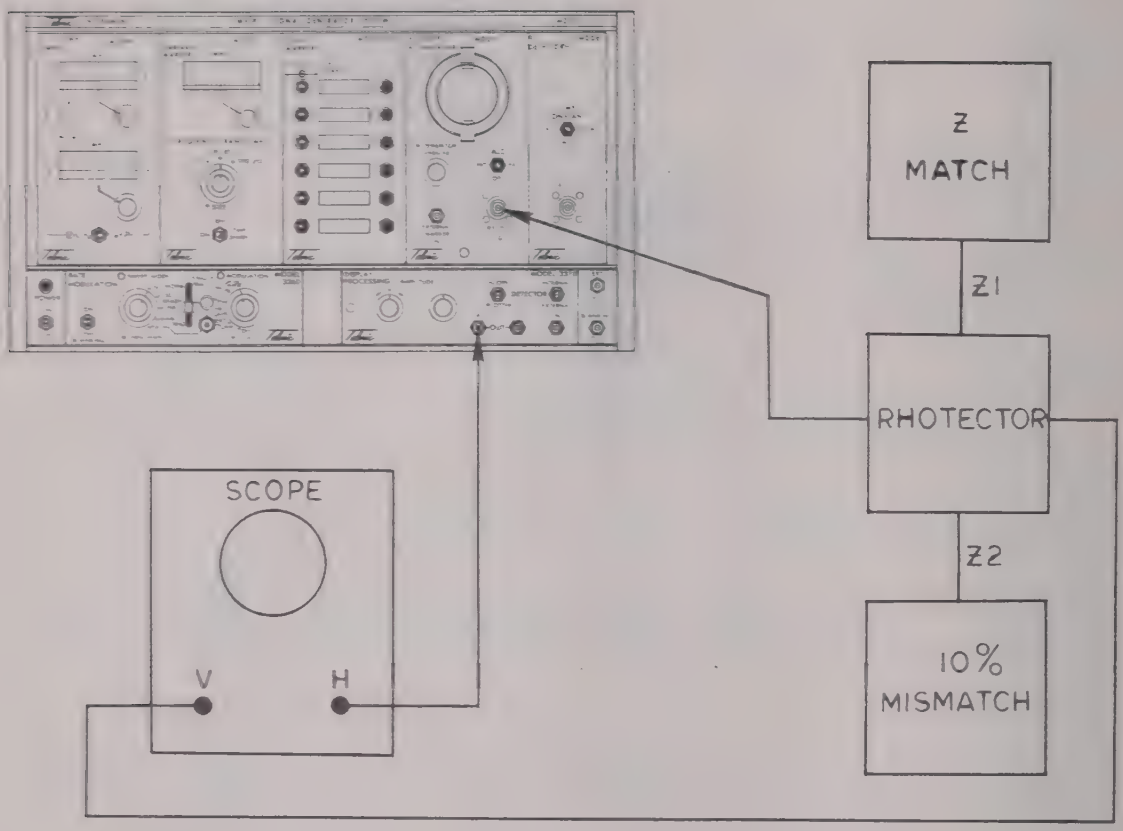


Figure 4-2. Typical VSWR Measurement Test Connections

a. Connect the equipment as shown in figure 4-3.

b. Adjust the f_1-f_c Control to 500 MHz.

c. Adjust the ATTENUATOR VERNIER Control for an indication of 5 mW on the power meter.

d. Remove the lead from the RF Output/Attenuator and connect an RF jumper to the RF DETECTOR.

e. Measure the DC output voltage displayed on the scope and, using the appropriate formula listed below, calculate the efficiency.

1. 3350 $\%\ Eff = \frac{DC\ VOLTS\ OUT}{0.500} \times 100$

2. 3351 $\%\ Eff = \frac{DC\ VOLTS\ OUT}{0.613} \times 100$

3. 3352 $\%\ Eff = \frac{DC\ VOLTS\ OUT}{0.548} \times 100$

f. Repeat paragraph 4-7., steps b. thru e., at 1000 MHz.

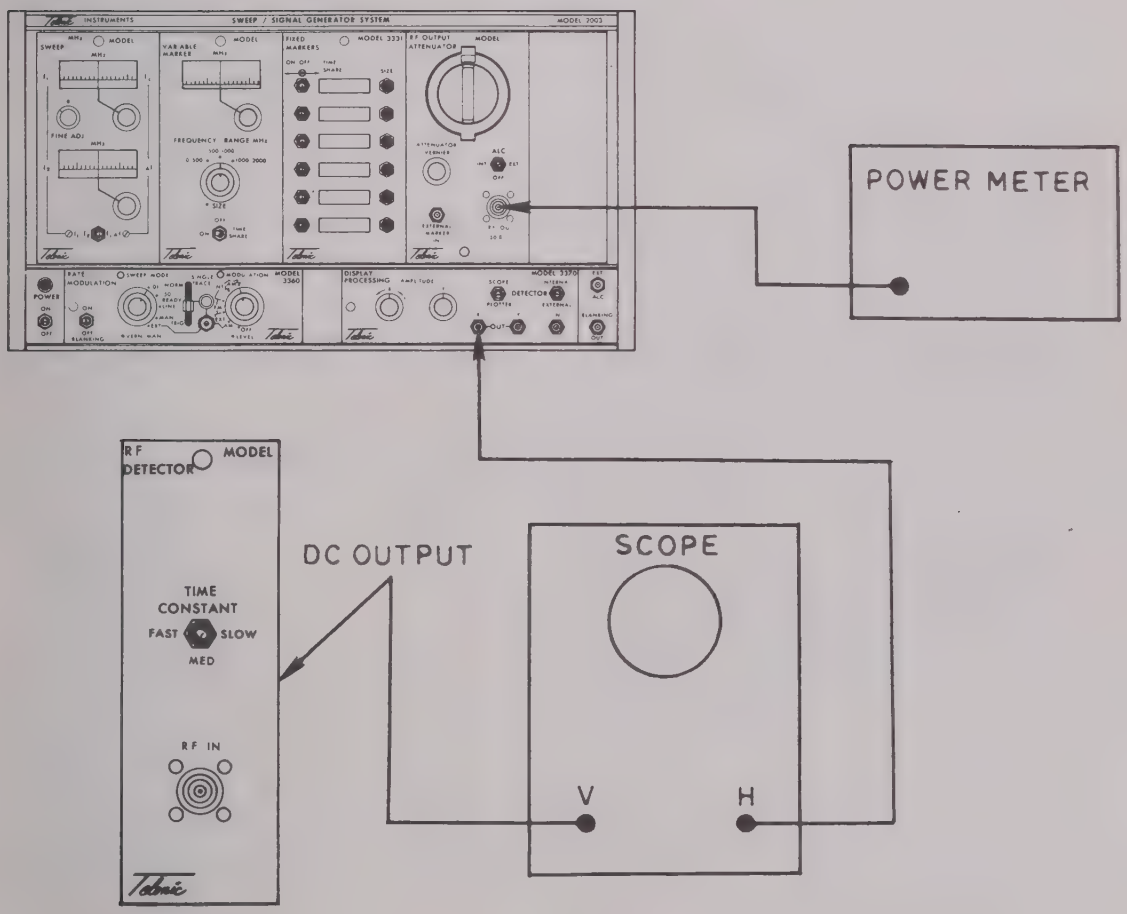


Figure 4-3. Typical Detector Efficiency Measurement Test Connections

SECTION V

PARTS LISTS AND SCHEMATIC DIAGRAMS

5-1. GENERAL.

5-2. This section provides the complete electrical parts list and a complete set of schematic diagrams required for maintenance of the 3350, 3351, 3352 RF DETECTOR PLUG-IN UNITS.

5-3. SCHEMATIC DIAGRAMS.

5-4. The following schematic diagrams are included in this manual:

a. RF Detector Interconnection Schematic — Figure 5-1.
b. RF Detector Schematic — Figure 5-2.

5-5. All resistors are shown in ohms unless otherwise specified.

5-6. All capacitors are shown in picofarads (pF) unless otherwise specified.

5-7. ABBREVIATION CODE.

5-8. Table 5-1. specifies the abbreviations used for components in the electrical Parts Lists.

TABLE 5-1.

Abbreviation Code	
CFD	Capacitor, Fixed, Discap
CFMY	Capacitor, Fixed, Mylar
DS	Diode, Semiconductor
RFC	Resistor, Fixed, Composition
RFMF	Resistor, Fixed, Metal Film
SWT	Switch, Toggle

5-9. PARTS LIST.

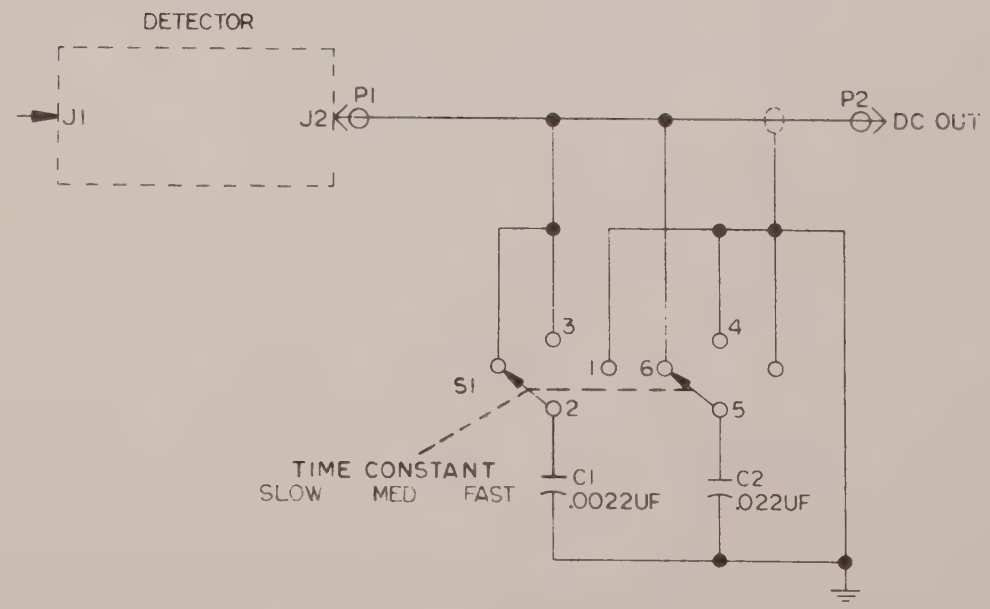
5-10. Tables 5-2. and 5-3. provide the complete electrical Parts List for the 3350/3351/3352 RF DETECTOR PLUG-IN UNITS.

TABLE 5-2.

Electrical Parts List

Interconnection Schematic Diagram (Assembly No. 970434)

Circuit Ref	Description	Typical Manufacturers	Manufacturers Part No.	Telonic Part No.
C1	CFMY, 0.0022 μF	Cornell Dubilier	WMF 2W22E	22-0014-03
C2	CFMY, 0.022 μF	Cornell Dubilier	WMF 2D22E	22-0014-04
P1	Plug, Elect	Dage	4982-3	44-0181-01
P2	Plug, Elect	Telonic		44-0065-01
S1	Switch, DPTT	Alcoswitch	MST205P	37-0128-01



ASS'Y. NO.
970434

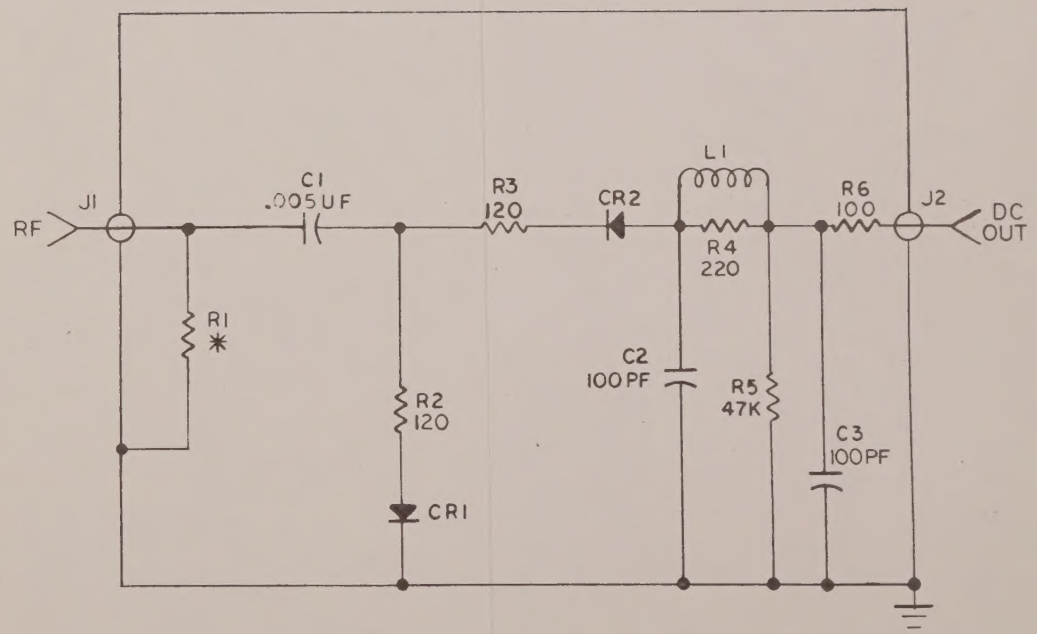
Figure 5-1. Interconnection Schematic Diagram

TABLE 5-3.

Electrical Parts List

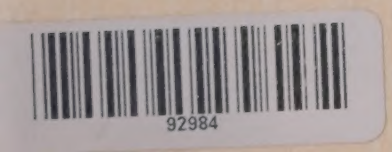
Detector Schematic Diagram (Assembly No. 970419)

Circuit Ref	Description	Typical Manufacturers	Manufacturers Part No.	Telonic Part No.
C1	CFD, 0.05µF, 600VDCW	Aerovox	99 DAX	21-0050-01
C2	CFD, 100pF	Aerovox	99 DAX	21-0045-01
C3	Same as C2			
CR1	DS, 1N82A	Kemtron	1N82A	41-0015-01
CR2	Same as CR1			
J1	Receptacle, Elect. Model 3350	Dage	019-1	44-0050-01
	Receptacle, Elect. Model 3351	Dage	252-1	44-0208-01
	Receptacle, Elect. Model 3352	Spinner	BN2830	44-0215-01
J2	Receptacle, Elect.	Amphenol	26-4200-16S	44-0191-01
L1	IF, 0.3µH	Telonic		43-0065-01
R1*	RFCF, 51Ω, ±1%, 1/2W Model 3350	Electra	DC-1/2C	27-2592-01
	RFCF, 75Ω, ±1%, 1/2W Model 3351	Electra	DC-1/2C	27-2538-01
	RFCF, 60.4Ω, ±1%, 1/2W Model 3352	Electra	DC-1/2C	27-2563-01
R2	RFC, 120Ω, ±10%, 1/8W	Allen-Bradley	BB1211	26-3024-01
R3	Same as R2			
R4	RFC, 220Ω, ±10%, 1/4W	Allen-Bradley	CB2211	26-1501-01
R5	RFC, 47kΩ, ±10%, 1/4W	Allen-Bradley	CB4731	26-1524-01
R6	RFC, 100Ω, ±10%, 1/4W	Allen-Bradley	CB1011	26-1522-01



ASSY. NO. 970419

Figure 5-2. Detector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